SUCCESS KEY

TEST SERIES

CLASS

10

MATHEMATICS

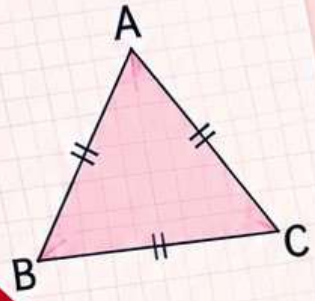
PART - 2

ENGLISH & SEMI ENGLISH MEDIUM

(MAHARASHTRA BOARD)

Smart Way of Learning

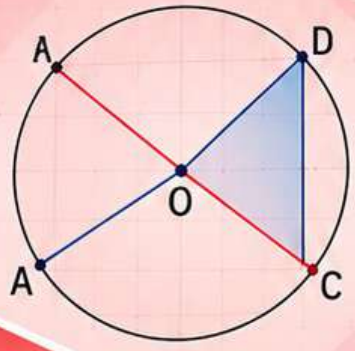
NOTES



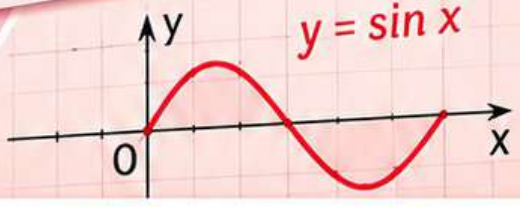


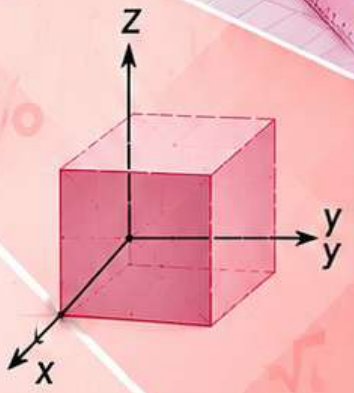






$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$





- Chapterwise Notes
- Important Points
- Formulas & Theorems
- Diagrams & Tables
- Exam Oriented

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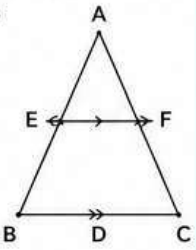
CHAPTER 01

SIMILARITY

CLASS 10 | MAHARASHTRA BOARD

THIS CHAPTER INCLUDES

- Similar Figures and Similar Triangles
- Ratio of Areas of Two Triangles
- Basic Proportionality Theorem (BPT)
- Converse of BPT
- Property of Angle Bisector of a Triangle
- Property of Three Parallel Lines and Their Transversals
- Tests of Similarity of Triangles (AA, SAS, SSS)
- Properties of Similar Triangles
- Areas of Similar Triangles



DEFINITION BOX

Similar Figures

Two figures having the same shape but not necessarily the same size are called **Similar Figures.**

Similar Triangles

Two triangles are said to be similar if :

(1) Their corresponding angles are equal.

(2) Their corresponding sides are proportional.

Symbol : $\Delta ABC \sim \Delta PQR$

MUST LEARN

Conditions for Similarity

If $\Delta ABC \sim \Delta PQR$ then,

$$\angle A = \angle P\ ,\ \angle B = \angle Q\ ,\ \angle C = \angle R$$

and

$$\frac{AB}{PQ} = \frac{BC}{QR} = \frac{CA}{PR}$$

MEMORY TRICK

"A – S Rule"

A → Angles Equal

S → Sides Proportional

If both conditions are satisfied,

→ Triangles are Similar.

IMPORTANT EXPLANATION

Corresponding Vertices

The order of vertices is extremely important.

Example : $\Delta ABC \sim \Delta DEF$

$A \leftrightarrow D \qquad B \leftrightarrow E \qquad C \leftrightarrow F$

Therefore,

$$\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$$

Board Tip :
Always identify corresponding vertices before writing proportions.

WHY DO WE STUDY SIMILARITY?

- ★ Find unknown lengths.
- ★ Compare geometrical figures.
- ★ Solve theorem-based problems.
- ★ Prove relationships between sides.
- ★ Solve practical measurement problems.
- ★ Reduce lengthy calculations.

APPLICATIONS OF SIMILARITY

- Preparing maps and scale drawings.
- Architectural designs.
- Engineering models.
- Photography enlargement and reduction.
- Surveying inaccessible distances.
- Designing miniature models.

SIMILARITY vs CONGRUENCY

Basis	Similarity	Congruency
Shape	Same Shape	Same Shape and Same Size
Sides	Corresponding Sides Proportional	Corresponding Sides Equal
Angles	Corresponding Angles Equal	Corresponding Angles Equal
Symbol	~ (Similar)	≅ (Congruent)
Size	Size may differ	Size remains same
Use	Used for comparison, measurement, scaling	Used for exact matching figures

SUCCESS KEY SOLVING HINTS

1. Draw or observe the figure carefully.
2. Mark corresponding angles with same symbols.
3. Identify corresponding sides before writing ratios.
4. Write the similarity statement in correct order.
5. Check your answer with the given data and conditions.

Mistakes in order of vertices lead to wrong ratios and loss of marks.

CHAPTER FLOWCHART

Similarity
↓
Equal Angles
↓
Proportional Sides
↓
Tests of Similarity (AA, SAS, SSS)
↓
Properties of Similar Triangles
↓
Areas of Similar Triangles
↓
Application Problems

THEOREM IDENTIFICATION HINT

Ask yourself these questions :

- Are two angles equal?
  → Think of **AA Test.**
- Are two pairs of sides proportional and included angle equal?
  → Think of **SAS Test.**
- Are all three corresponding sides proportional?
  → Think of **SSS Test.**

Memory Trick :
"2 Angles → AA, 2 Sides + Angle → SAS, 3 Sides → SSS"

SCORE BOOSTER

Whenever triangles are similar :

- ★ Corresponding angles are equal.
- ★ Corresponding sides are proportional.
- ★ Ratio of corresponding sides remains constant.

This constant ratio is called the **Scale Factor.**

Scale Factor Hint :

If $\frac{AB}{PQ} = 2$, then every side of Δ ABC is twice the corresponding side of Δ PQR.

QUICK THINKING TIP

Before calculation, ask :

1. Which triangles are being compared?
2. Which vertices correspond?
3. Which similarity test can be used?
4. What is the required quantity?

This 10-second check prevents most mistakes.

TESTS OF SIMILARITY OF TRIANGLES

★ Two triangles are similar if they satisfy **any one** of the following tests. ★

1 AA SIMILARITY TEST

If two angles of one triangle are equal to two corresponding angles of another triangle, then the triangles are similar.

If,

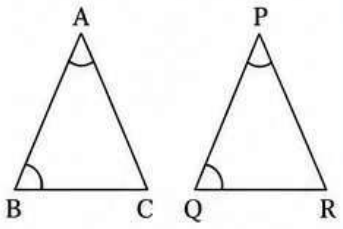
$$\angle A = \angle P$$

and

$$\angle B = \angle Q$$

Then,

$$\Delta ABC \sim \Delta PQR$$



2 SAS SIMILARITY TEST

If two sides of one triangle are proportional to two corresponding sides of another triangle and the included angles are equal, then the triangles are similar.

If,

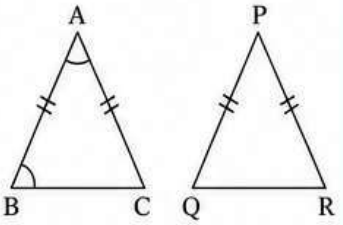
$$\frac{AB}{PQ} = \frac{AC}{PR}$$

and

$$\angle A = \angle P$$

Then,

$$\Delta ABC \sim \Delta PQR$$



3 SSS SIMILARITY TEST

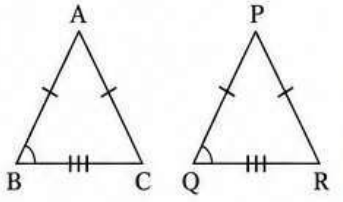
If the corresponding sides of two triangles are proportional, then the triangles are similar.

If,

$$\frac{AB}{PQ} = \frac{BC}{QR} = \frac{AC}{PR}$$

Then,

$$\Delta ABC \sim \Delta PQR$$



DEFINITION BOX

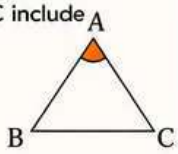
Included Angle

The angle formed between the two sides under consideration is called the Included Angle.

Example :

In Δ ABC,

Sides AB and AC include ∠A.



HOW TO IDENTIFY THE TEST?

Given Information	Test Used
Two equal angles	AA Test
Two proportional sides + Included angle	SAS Test
Three proportional sides	SSS Test

SUCCESS KEY MEMORY TRICK

"2A – 2S – 3S Rule"

2A	2S + Angle	3S
Two Angles	Two Sides + Included Angle	Three Sides
↓	↓	↓
AA Similarity	SAS Similarity	SSS Similarity

IMPORTANT EXPLANATION

Why AA Test Works ?

If two angles are equal, the third angles automatically becomes equal because

Sum of angles of a triangle = 180°

Therefore, only two equal angles are sufficient.

$$\angle A + \angle B + \angle C = 180°$$

THEOREM APPLICATION HINTS

Use AA Test When :

- Parallel lines produce equal angles.
- Alternate angles are given.
- Corresponding angles are equal.
- Vertically opposite angles appear.

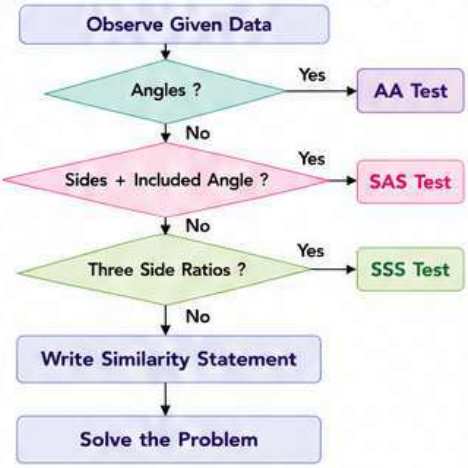
Use SAS Test When :

- Side ratios are given.
- Included angle is mentioned.
- Two triangles share a common angle.

Use SSS Test When :

- Only side lengths are provided.
- No angle information is available.
- All three side ratios can be formed.

SUCCESS KEY FLOWCHART



GOLDEN TIPS

- ★ Always identify corresponding vertices first.
- ★ Write similarity statement before solving.
- ★ Maintain the same order of sides.
- ★ Mark equal angles in the figure.
- ★ Draw rough figures whenever possible.
- ★ Box the final answer.

SUCCESS KEY SCORE BOOSTER

Before selecting the test, ask :

"WHAT IS GIVEN?"

- ★ If angles are given → AA
- ★ If side ratios + angle are given → SAS
- ★ If all side ratios are given → SSS

This simple approach saves time in examinations.

BASIC PROPORTIONALITY THEOREM (BPT) & CONVERSE OF BPT

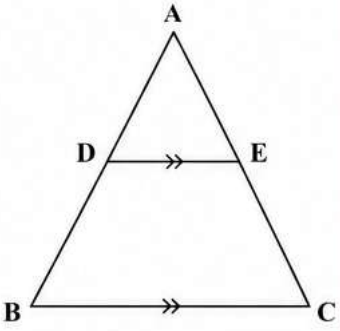
1 BASIC PROPORTIONALITY THEOREM (BPT)

Statement

If a line is drawn parallel to one side of a triangle and intersects the other two sides in distinct points, then it divides those two sides in the same proportion.

Given

In ΔABC,
D lies on AB,
E lies on AC,
and
$DE \parallel BC$



To Prove

$$\frac{AD}{DB} = \frac{AE}{EC}$$

DEFINITION BOX

Proportional Segments

Two ratios are said to be proportional if they are equal.

Example :

$$\frac{2}{4} = \frac{3}{6} \Rightarrow 0.5 = 0.5$$

Therefore, the segments are proportional.

2 MASTER THEOREM BOX

BPT Formula

If $DE \parallel BC$, then,

$$\frac{AD}{DB} = \frac{AE}{EC}$$

Alternative Form

$$\frac{AD}{AB} = \frac{AE}{AC}$$

Another Useful Form

$$\frac{DB}{AB} = \frac{EC}{AC}$$

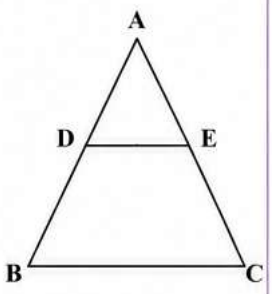
3 CONVERSE OF BPT

Statement

If a line divides any two sides of a triangle in the same proportion, then that line is parallel to the third side.

Given

In ΔABC,
D lies on AB,
E lies on AC,
and
$\frac{AD}{DB} = \frac{AE}{EC}$



Conclusion

$DE \parallel BC$

4 SUCCESS KEY MEMORY TRICK

"Parallel → Ratio" (BPT)	"Ratio → Parallel" (Converse of BPT)
Parallel Line	Equal Ratios
↓	↓
Equal Ratios	Parallel Line

Easy Memory :
BPT : Parallel First | Converse : Ratio First

5 HOW TO IDENTIFY THE THEOREM?

Use BPT When :

- A parallel line is given.
- Need to prove ratios.
- Need to find unknown lengths.

Use Converse of BPT When :

- Ratios are given.
- Need to prove lines are parallel.
- Parallel condition is not directly stated.

6 IMPORTANT EXPLANATION

Why BPT is Important?

- Find missing lengths quickly.
- Prove geometrical relationships.
- Solve similarity problems.
- Establish parallelism.
- Reduce lengthy calculations

7 SUCCESS KEY SCORE BOOSTER

Before solving any BPT problem, ask :
"WHAT IS GIVEN?"

- If parallel line is given → Apply BPT.
- If equal ratios are given → Apply Converse of BPT.

This simple check prevents confusion.

8 SUCCESS KEY FLOWCHART

If Parallel Line is Given

Parallel Line Given
↓
BPT
↓
Write Proportions
↓
Substitute Values
↓
Find Unknown Quantity
↓
Conclude

If Ratios are Given

Ratios Given
↓
Converse of BPT
↓
Prove Parallel Lines
↓
Conclude

9 GOLDEN TIPS

- Draw the triangle neatly.
- Mark parallel lines clearly.
- Write the theorem before substitution.
- Keep ratios in the same order.
- Verify the correspondence carefully.
- Box the final answer.

PROPERTIES OF SIMILAR TRIANGLES

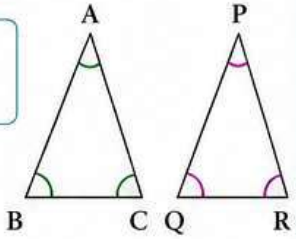
1 MUST LEARN

Property of Similar Triangles

If $\triangle ABC \sim \triangle PQR$, then their corresponding sides are proportional.

$$\frac{AB}{PQ} = \frac{BC}{QR} = \frac{AC}{PR}$$

and their corresponding angles are equal.



2 MASTER PROPERTY BOX

Ratio of Corresponding Sides

If $\triangle ABC \sim \triangle PQR$, then

$$\frac{AB}{PQ} = \frac{BC}{QR} = \frac{AC}{PR}$$

This common ratio is called the **Scale Factor (k).**

Corresponding Angles

$$\angle A = \angle P$$
$$\angle B = \angle Q$$
$$\angle C = \angle R$$

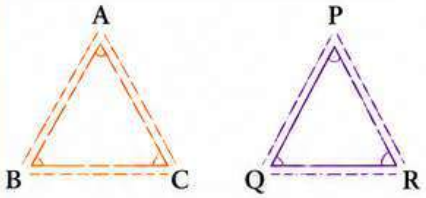
3 IMPORTANT PROPERTY

Ratio of Perimeters

The ratio of the perimeters of two similar triangles is equal to the ratio of their corresponding sides.

If $\triangle ABC \sim \triangle PQR$, then

$$\frac{\text{Perimeter of } \triangle ABC}{\text{Perimeter of } \triangle PQR} = \frac{AB}{PQ}$$



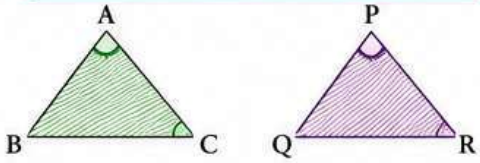
4 RATIO OF AREAS OF SIMILAR TRIANGLES

Theorem

The ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides.

If $\triangle ABC \sim \triangle PQR$, then

$$\frac{\text{Area of } \triangle ABC}{\text{Area of } \triangle PQR} = \left(\frac{AB}{PQ}\right)^2$$
$$= \left(\frac{BC}{QR}\right)^2 = \left(\frac{AC}{PR}\right)^2$$



5 SUCCESS KEY MEMORY TRICK

"Side → Square → Area"

Side Ratio
↓
Square It
↓
Area Ratio

Easy Recall

$$\text{Area} = (\text{Side Ratio})^2$$

6 HOW TO IDENTIFY THE PROPERTY?

If the question asks about:

- **Unknown side** → Use side ratios.
- **P** — **Perimeter comparison** → Use perimeter ratio.
- **A** — **Area comparison** → Square the side ratio.
- **k** — **Scale factor** → Use corresponding sides.

7 SCALE FACTOR CONCEPT

Suppose $\frac{AB}{PQ} = 3$

Side Ratio	3 : 1
Perimeter Ratio	3 : 1
Area Ratio	9 : 1

Board Hint : Always square the ratio only for areas, not for sides or perimeters.

8 EXAMINER'S OBSERVATION

Students often make these mistakes :

- Forgetting to square the ratio for area.
- Squaring perimeter ratios.
- Using non-corresponding sides.
- Writing ratios in reverse order.
- Ignoring the similarity statement.

9 SUCCESS KEY SCORE BOOSTER

3-Step Rule

Step 1 : Find corresponding sides.
↓
Step 2 : Identify what is asked.
↓
Step 3 : Apply the correct property.

Remember

- Sides → Same Ratio
- Perimeters → Same Ratio
- Areas → Squared Ratio

10 PROPERTY FLOWCHART

Prove Similarity
↓
Identify Corresponding Sides
↓
What is Required?
↓
Side → Use Side Ratio
Perimeter → Use Same Ratio
Area → Use Squared Ratio
↓
Substitute
↓
Answer

11 SUCCESS KEY FORMULA STRIP

Similar Triangles

$$\frac{AB}{PQ} = \frac{BC}{QR} = \frac{AC}{PR}$$

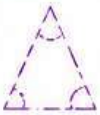


Area Ratio

$$\frac{A_1}{A_2} = \left(\frac{AB}{PQ}\right)^2$$

Perimeter Ratio

$$\frac{P_1}{P_2} = \frac{AB}{PQ}$$



P_1, P_2 → Perimeters

A_1, A_2 → Areas

CLASS 10 | MATHEMATICS PART 2

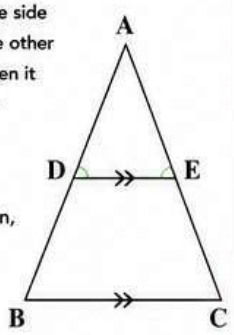
★ BASIC PROPORTIONALITY THEOREM (BPT) ★

1 MUST LEARN

Basic Proportionality Theorem (BPT)

Statement

If a line is drawn parallel to one side of a triangle and intersects the other two sides in distinct points, then it divides those two sides in the same proportion.



Mathematical Form

In $\triangle ABC$, if $DE \parallel BC$ then,

$$\frac{AD}{DB} = \frac{AE}{EC}$$

★ Parallel line divides sides proportionally.

2 THEOREM DIAGRAM INFORMATION

Consider $\triangle ABC$.

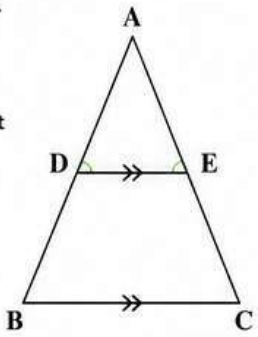
D lies on AB.

E lies on AC.

Join DE such that $DE \parallel BC$

Then,

$$\frac{AD}{DB} = \frac{AE}{EC}$$



Key Observation

Parallel line → Proportional division → BPT

✓ Parallel ⇒ Ratios

3 CONVERSE OF BPT

Statement

If a line divides any two sides of a triangle in the same proportion, then that line is parallel to the third side.

If $\frac{AD}{DB} = \frac{AE}{EC}$

↓

$DE \parallel BC$

Easy Identification

Equal Ratios → Converse of BPT → Prove Parallelism

✓ Ratios ⇒ Parallel

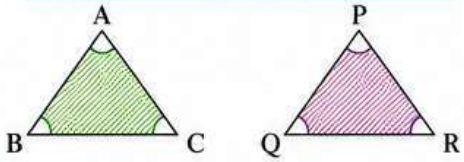
4 RATIO OF AREAS OF SIMILAR TRIANGLES

Theorem

The ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides.

If $\triangle ABC \sim \triangle PQR$, then

$$\frac{Area\ of\ \triangle ABC}{Area\ of\ \triangle PQR} = \left(\frac{AB}{PQ}\right)^2 = \left(\frac{BC}{QR}\right)^2 = \left(\frac{AC}{PR}\right)^2$$



5 SUCCESS KEY MEMORY TRICK

"Side → Square → Area"

Side Ratio

↓

Square It

↓

Area Ratio

Easy Recall

Area = (Side Ratio)²

6 HOW TO IDENTIFY THE PROPERTY?

If the question asks about:

- **Unknown side** → Use side ratios.
- **P** — Perimeter comparison → Use perimeter ratio.
- **A** — Area comparison → Square the side ratio.
- **k** — Scale factor → Use corresponding sides.

7 CONVERSE FLOWCHART

Triangle

↓

Ratios Given?

↓

YES

↓

Check Equality

↓

Apply Converse

↓

Prove $DE \parallel BC$

↓

Answer

8 COMMON EXAM ERRORS

Students often make these mistakes :

- ✗ Writing incorrect ratios.
- ✗ Mixing corresponding segments.
- ✗ Ignoring parallel condition.
- ✗ Using converse instead of theorem.
- ✗ Writing ratios in reverse order.
- ✗ Omitting final conclusion.



9 SUCCESS KEY GOLDEN TIPS

- ★ Draw the theorem figure neatly.
- ★ Mark the parallel line clearly.
- ★ Use same order in ratios.
- ★ Mention theorem name before applying.
- ★ Show substitutions.
- ★ Box the final result.
- ★ Write "Hence Proved."



10 SUCCESS KEY FORMULA STRIP

Similar Triangles

$$\frac{AB}{PQ} = \frac{BC}{QR} = \frac{AC}{PR}$$



Perimeter Ratio

$$\frac{P_1}{P_2} = \frac{AB}{PQ}$$



Area Ratio

$$\frac{A_1}{A_2} = \left(\frac{AB}{PQ}\right)^2$$

P_1, P_2 → Perimeters

A_1, A_2 → Areas

11 LAST MINUTE REVISION SHEET

BPT	Converse	Board Formula	Final Tip
Parallel → Ratios	Ratios → Parallel	$\frac{AD}{DB} = \frac{AE}{EC}$	Identify whether the question gives parallel lines or equal ratios before selecting the theorem.

CHAPTER 01

SIMILARITY

MATHEMATICS PART 2

Success Key Test Series

★ → COMPLETE CHAPTER REVISION (LAST MINUTE REVISION SHEET) ← ★

1 SIMILARITY

Definition

Two figures having the same shape but not necessarily the same size are called similar figures.

Similar Triangles

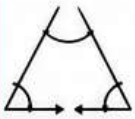
Two triangles are similar if:

- Their corresponding angles are equal.
- Their corresponding sides are proportional.

Symbol

$\triangle ABC \sim \triangle PQR$

2 TESTS OF SIMILARITY

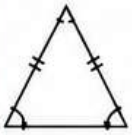


AAA Test

If three corresponding angles are equal,

↓

Triangles are similar.



SAS Test

If two corresponding sides are proportional and the included angle is equal,

↓

Triangles are similar.



SSS Test

If corresponding sides are proportional,

↓

Triangles are similar.

3 PROPERTIES OF SIMILAR TRIANGLES

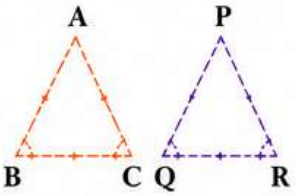
If $\triangle ABC \sim \triangle PQR$ then,

Side Ratio

$$\frac{AB}{PQ} = \frac{BC}{QR} = \frac{AC}{PR}$$

Perimeter Ratio

$$\frac{P_1}{P_2} = \frac{AB}{PQ}$$



Area Ratio

$$\frac{A_1}{A_2} = \left(\frac{AB}{PQ}\right)^2$$

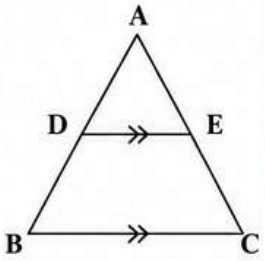
4 BASIC PROPORTIONALITY THEOREM (BPT)

Theorem

If a line is drawn parallel to one side of a triangle, then it divides the other two sides in the same proportion.

In $\triangle ABC$, $DE \parallel BC$ then

$$\frac{AD}{DB} = \frac{AE}{EC}$$



5 CONVERSE OF BPT

If

$$\frac{AD}{DB} = \frac{AE}{EC}$$

then

$$DE \parallel BC$$

6 CHAPTER MIND MAP

Similarity
↓
Tests of Similarity
↓
Properties
↓
BPT
↓
Converse of BPT
↓
Applications
↓
Answer



7 SUCCESS KEY MEMORY TABLE

Topic	Remember
Similarity	Same Shape
AAA	Angles Equal
SAS	Sides + Included Angle
SSS	All Sides Proportional
BPT	Parallel → Ratios
Converse	Ratios → Parallel
Area Ratio	Square of Side Ratio



8 CONVERSE FLOWCHART

Triangle
↓
Ratios Given?
↓
YES
↓
Check Equality
↓
Apply Converse
↓
Prove $DE \parallel BC$
↓
Answer



9 SUCCESS KEY FORMULA MASTER TABLE

Concept	Formula
Side Ratio	$\frac{AB}{PQ} = \frac{BC}{QR} = \frac{AC}{PR}$
Perimeter Ratio	$\frac{P_1}{P_2} = \frac{AB}{PQ}$
Area Ratio	$\frac{A_1}{A_2} = \left(\frac{AB}{PQ}\right)^2$
BPT	$\frac{AD}{DB} = \frac{AE}{EC}$
Converse	Ratios → Parallel

10 ONE PAGE QUICK RECAP

Similar Figures → Same Shape
↓
Similarity Tests → AAA • SAS • SSS
↓
Properties → Sides • Perimeters • Areas
↓
BPT → Parallel → Ratios
↓
Converse → Ratios → Parallel
↓
Answer